
The Use of Personal Computers in Scientific Research and Writing

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Personal Computers (PC) are now frequently used in many industries and are gaining an increasing popularity in the field of applied sciences. The purpose of this work is to outline the advantages of computers in the field of scientific research and writing and to recommend the applications of this technology from the practical experience of the author.

THE HARDSHIP

The efforts involved in the use of the traditional manual method of a "pencil and paper" to analyze scientific data, and to prepare typescripts acceptable for publication in scientific journals are lengthy and difficult. Before attempting to write the text the author must at first extract the main results from his experiment, analyze their meaning and scientific value, arrange and verify the statistical data, and design the artwork of the text. The latter is usually given to a professional artist to prepare it in a re-printable form. Very often an author is dissuaded from attempting to write a good report for lack of such professional expertise.

Having read the relevant literature of the work, the author will then proceed to compile it in a handwritten form using loads of stationery and continuously referring to standard and specialized scientific dictionaries. He also has to establish correct syntax. The manuscript has then to be given to a typist to prepare a readable typescript. The latter has then to be cycled back to the author to undertake more changes, the co-authors too add their contribution, the internal referees to recommend modifications, and the editor and his referees to suggest further changes. All these tasks add more work on the principal author and the typist, thus delaying the publication of the work. In some instances even minor changes to the text may entail the whole work to be retyped.

The style of manuscripts may change from one journal to another, and many good scientific works are rejected because they do not conform to the style of the journal. There is nothing more disturbing to any author than asking him to retype the text and in particular the list of references using different style of writing. The hardship of this task will be appreciated whenever a work rejected by one journal is being restyled for another.

The answer to the above hardship is to take advantage of the ease, speed, efficiency, accuracy, and cost-effectiveness of the microcomputer technology. Two basic components are required to obtain the best of this advancement; the configuration of the PC i.e. the hardware, and the choice of computer programs i.e. the software.

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THE HARDWARE

These are the electronic components of the computer and the minimal basic requirements recommended for the purpose of scientific research and writing is to have a system consisting of a PC unit, a colour display, and a dot matrix printer. Computers are bought configured to the budget and need of the user, and the recommendation is to use a system configured with 640 K bytes memory, two 360 K floppy disk drives and one 20 M fixed hard disk to store large data and run large software.

THE SOFTWARE

These are the computer applications developed by the computer industry to serve the needs of scientific research and to assist in the writing of texts. It is easy to operate these software and knowledge of computers and their language is not required apart from simple basic commands. Most of the software, however, are available in integrated packages covering a range of utilities such as wordprocessing, dictionary, spreadsheet, database management, statistical analysis, and graphics. But there are also many other powerful specialized software capable of executing only one of these functions.

Several examples of software will be listed below to promote scientific research, and to assist in the preparation of texts. At least two programs will be recommended to operate each of the various fields of these domains. The choice of any of these is dependent on the hardware configuration of the PC, the versatility of the software, and the needs and satisfaction of the user. However, for the purpose of analysis of scientific research, it is recommended to master one program on database management and another on statistical treatment, and for the purpose of preparation of texts, to operate a wordprocessor and a dictionary. All other listed software are discretionary and their employment is left to prerequisites of the operator.

THE DATABASE MANAGEMENT

A database (referred to in the computer jargon as DB) is a repository of stored information organized in such a way that data is easily retrieved, and examined interchangeably using an application software called database management system (DBMS). The main application of this system is in the setting up and analysis of scientific data. They are also useful in the preparation and printing of tables and the list of references of the text. There are many DBMS programs in the market, the most popular of which is "dbase III" by Ashton-Tate, USA. Other powerful programs include "Foxbase" by Fox Software, USA, and "Q & A" by Symantec Corp, USA. The latter incorporates artificial intelligence through which the operator can communicate with the software using common English language rather than intricate computer commands.

THE ARTWORK

Preparing artwork (e.g. graphs, pie charts, histograms etc.) for scientific works is not only time consuming but also requires many skills. Moreover the experience of professional artist is often very expensive and most authors are discouraged to use it and tend to rely on their amateurish preparations. However, using specialized graphics software packages, it is easy to obtain a good quality print out of artwork, which is as good

as that produced by the professional artist, and is acceptable for publication in most scientific journals. The advantage here is speed and economy. The recommended software for this task is "Symphony" by Lotus Development Corp, USA.

WRITING WITH WORDPROCESSORS

Wordprocessors are powerful programs capable of performing full text manipulation in a very efficient, accurate, and speedy manner that cannot be matched by the most experienced typist. These can provide such functions as copying, insertions, deletions and moving of characters, words, paragraphs, or entire documents. They are also helpful in the setting up of characters of letters, page number, margins, spaces, and footnotes. The final output is to obtain a product which fulfils the common salesmanship jargon of WYSIWYG (What You See — on the display — Is/What You Get — on the paper —). The most popular wordprocessor recommended for use are "Multimate" by Ashton-Tate Corp, USA and "Wordstar" by MicroPro International Corp, USA.

THE USE OF DICTIONARY

Having completed writing the text, the author may wish to check the spelling of the work by running a standard dictionary program. This saves the time and hardship of manual search, ensures uniform orthography throughout the text, and help in building own scientific terminology. There are many dictionary programs in the computer market and the recommended one which contains a large vocabulary of words is "Webster's New World Spelling Checker" developed by Korenthal Associates Inc, USA. Another recommended software is "Proofreader" by Aspen Software Co, USA.

CITATIONS AND THE LIST OF REFERENCES

As mentioned earlier, writing and changing the style of the list of references of the typescript is tiresome. However using a PC, the list can be prepared and printed using a wordprocessor or a DBMS. Nevertheless the citations in the text itself must be changed using a wordprocessor. There are however, two programs in the software market which, not only can change the style of citation within the text itself, but can also print the list in any required style. These are "Reflist" privately distributed by E.J. Shillitose, 5326 Dumfries Drive, Houston, Tx 77096, USA, and "Manuscript Manager" developed by Pergamon Software, USA.

THE ON-LINE UTILITIES

Several on-line utilities may be found useful while writing scientific texts. The advantage of these software is that the operator can take full advantage of their functions without the need of ending the wordprocessing program with which the text is being prepared. The "Webster's New World Thesaurus Dictionary" (developed by Korenthal Associates Inc, USA) is useful program to use offering instant spelling checker, and full usage of Thesaurus dictionary including search, edition, and replacement of synonyms. This avoids unnecessary repetition of words and enables the operator to introduce a colourful vocabulary in the text.

Another recommended on-line utility is "Sidekick" by Borland International, USA. This is an easy to operate software offering a calculator, a calender, and a "notepad" on which memorandums and reminders can be written.

STATISTICAL WORK

There are many software capable of performing statistical analysis of scientific data at a speed and reliability that cannot be matched by even the most advanced programmable calculator. The choice of these software is dependent on the amount of the data to be analysed and the type of statistical computation to be performed. "Lotus 123" (by Lotus Development Corp, USA) and "SPSS" (by SPSS Inc, USA) are among the most commonly used programs in this field. The DBMS can also be used to provide simple mathematical operations. These software, however, can only be employed when the results of the experiment under work i.e. the data are being analysed, and cannot be run during the wordprocessing of the text unless the operator is using other software which allow the interchange between more than one program. It is worth mentioning in this connection that the on-line calculator utility of "Sidekick" is very helpful.

ARTIFICIAL INTELLIGENCE

Although all the programs written by the software industry are a form of artificial intelligence, those developed for scientific writing to make computer judgements are newcomers to this technology. There are two useful programs which need to be considered; one is "Grammatik II" by Wang Laboratories Inc, USA to check the syntax of the text, and the other is "Rightwriter" by Decisionware Inc, USA. The latter assesses the text for its index of jargon, level of readability, weak phrases, adequacy of adjectives and adverbs, frequency of common and uncommon words, and the structure of sentences for their length, completeness and the presence of passive voices to be changed to active statements.